Interproximal grooving of teeth

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The oldest example of the use of the toothpick, a technological and cultural artifact, evidenced by interproximal grooves, comes from an upper first premolar of one of the earliest representatives of the genus Homo, L 894-1 - 1.84 million years old, from the Ethiopian site Omo. Studies of these grooves, location and longitudinal polish and striations similar to those documented in a modern population, have led to a consensus that toothpick may be one of the earliest tools devised by humanity.

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Studies of interproximal grooves have led to a consensus that the toothpick may be one of the earliest tools devised by humanity. Paul G. Bahn has reported in Nature the results of this communication concerning "The consistent location of the grooves ; the longitudinal polish and striations, suggesting a prolonged back-and-forth movement of an inflexible probe; and the similarity of the prehistoric grooves to those documented in historical and modern populations ...". nature 23 February 1989 **Vol. 337 no. 6209 Early teething troubles** p. 693

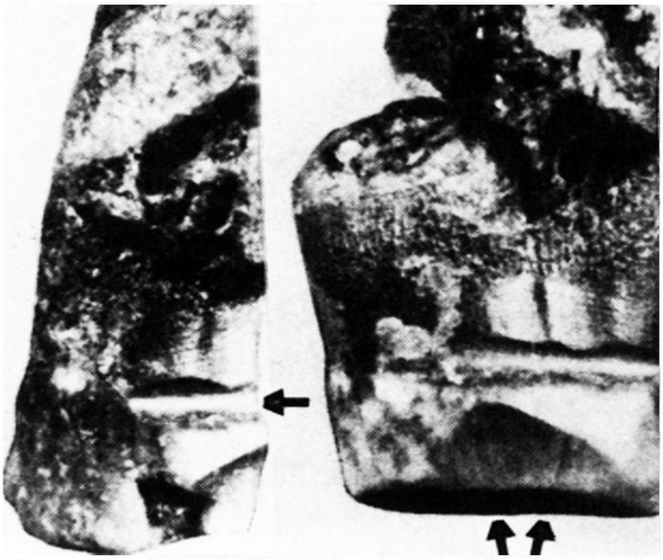

FIG. 1. *Interproximal grooving in* H. habilis *(L 894-1 from Omo). (Photo courtesy of N. Boaz.)*

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Habitual therapeutic use of toothpicks has been known since the dawn of time. We have found evidence for non-masticatory wear related to dental hygiene in prehistoric dentitions dating back to *H. habilis.* The earliest such wear identified to date occurs on the upper first premolars of L 894-1 from Omo, dated at 1.84 million years B.P. (fig. 1). Both these teeth show interproximal grooving at the cervical enamel line on their distal surfaces. These grooves, semicircular and wider and deeper buccally, extend from the lingual to the buccal side and microscopically are floored by fine parallel scratches. The radiating channels on the proximal wear facet leading to the transverse groove give evidence of the impaction of food in that area.

An upper first molar of *Sinanthropus officinalis (H. erectus)* shows under the proximal wear facet a very weak interproximal depression that is revealed by low-power microscopic scanning to contain innumerable fine parallel scratches running buccolingually, the buccal ones intersecting the perikymata (fig. 2). Two adult lower molars, AT/B11 and AT/B14, of *H. erectus* from Atapuerca, Spain, show very marked interproximal grooves, both mesial and distal, that occur cervical to the interproximal contact facet, where no traces of abrasion have been noted. The grooves are found on polished surfaces and can therefore be considered recurrent "accidents" in the course of a lifetime (fig. 3).

An upper third molar of the Neanderthal Hortus XI has an interproximal groove on its mesial surface that is tubular in appearance and more pronounced on the buccal end and that under magnification exhibits parallel striations of the dentine (fig. 4). It conforms to the pattern that Ubelaker, Phenice, and Bass (1969) and Berryman, Owsley, and Henderson (1979) have attributed to the use of an inflexible probe, where the angle of insertion is guided and restricted by the cheeks and conse-

FIG. 2. *Scanning electron microscope identification (×30) of scratches in the interproximal depression of the upper first molar of* Sinanthropus officinalis (H. erectus).

FIG. 4. *Tubular groove on the upper third molar of the Neanderthal Hortus XI.*

FIG. 3. *Photonic microscope identification (×30) of interproximal grooves in* H. erectus *from Atapuerca. Tooth-on-tooth wear facet (at top) is useful in indicating absence of postmortem damage.*

quently differs with the position of the tooth in the mouth.

Two teeth from the Bronze Age (ca. 2500 B.C.) site of Peyraoutes also show interproximal grooves. An upper molar has grooves between the contact area and an associated carious lesion (figs. 5 and 6). (In the first stages of an interproximal carious lesion, the gingiva may show very little recession and the abrasive lesions be located only on the enamel.) A central incisor has three linear grooves on the distal surface oriented perpendicular to the mesiodistal axis—an orientation that is linked to the angle of insertion of the agent responsible for them. These grooves are near the contact area rather than the cervical enamel line and because of the tooth's morphology are wider and deeper in the middle than at their ends. Under the microscope, fine parallel scratches are revealed that run buccolingually and on the buccal and lingual surfaces crisscross at the ends (fig. 7), giving evidence of the use of the anterior dentition in manipulative tasks such as have been recorded ethnographically (e.g., Larsen 1985). Cybulski (1974) has noted similar grooves associated with the female dentition only.

The occurrence of noncarious interproximal grooves on the dentition was first reported by Siffre (1911) on the lower first and second molars of La Quina V and interpreted as the result of constant picking of the teeth. Weidenreich (1937), describing identical interproximal

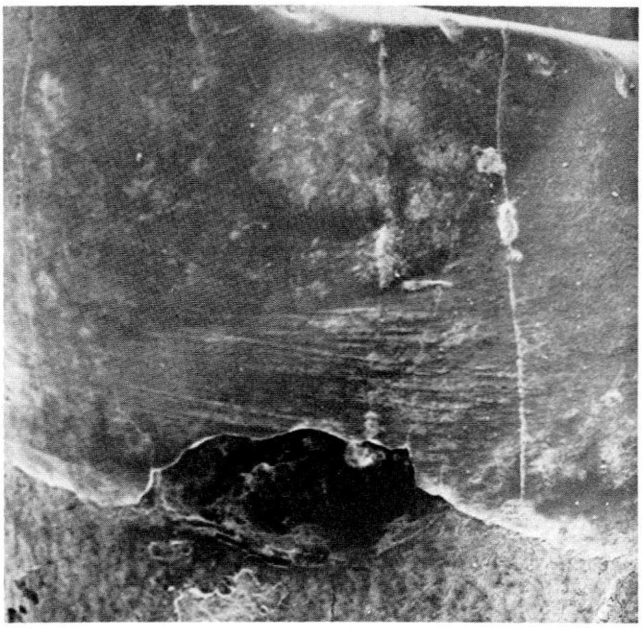

FIG. 5. *Grooving associated with carious lesion (× 10) in* H. sapiens sapiens *from Peyraoutes.*

FIG. 7. *Scratches on a central incisor from Peyraoutes (× 50) indicating use of the anterior dentition in manipulative tasks.*

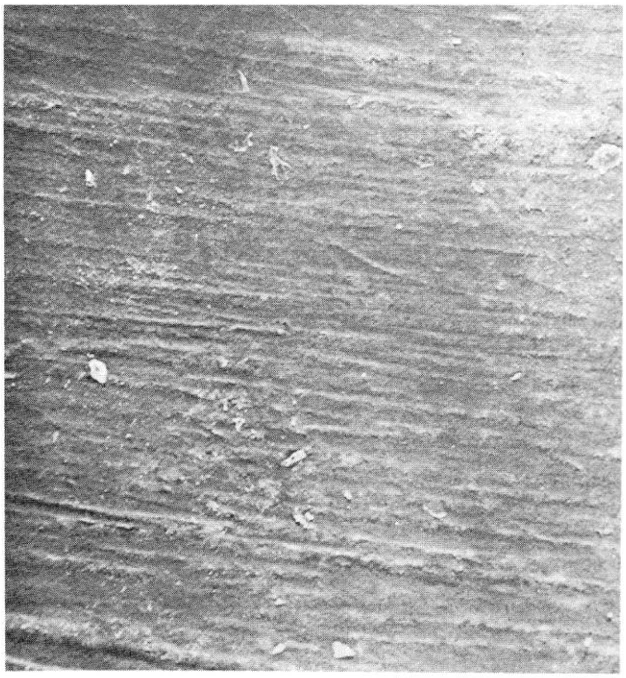

FIG. 6. *Detail of figure 5 (× 50).*

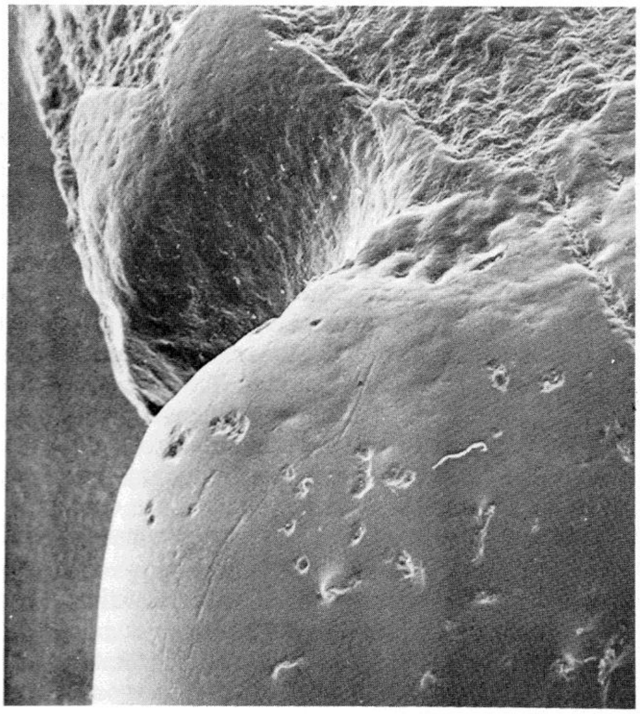

FIG. 8. *Buffalo central incisor with groove below the proximal cervical enamel line (× 15).*

grooves on two *Sinanthropus* molars, rejected the tooth-picking hypothesis in favor of acid decalcification and consequent chemical erosion. Sognnaes (1959) also attributed dental grooving to chemical erosion. Wallace (1974) argued against both erosion and tooth-picking, pointing out that von Koenigswald had identified interproximal grooves on the central incisors of a fossil buffalo. Schulz (1977) judged Wallace's argument inconclusive because von Koenigswald (1972 and personal communication) had explained the grooving of both *Sinanthropus* and buffalo teeth in terms of the stripping of highly abrasive grasses and leaves. Our own examination of one of Weidenreich's two buffalo central incisors revealed a groove below the cervical enamel line (fig. 8)

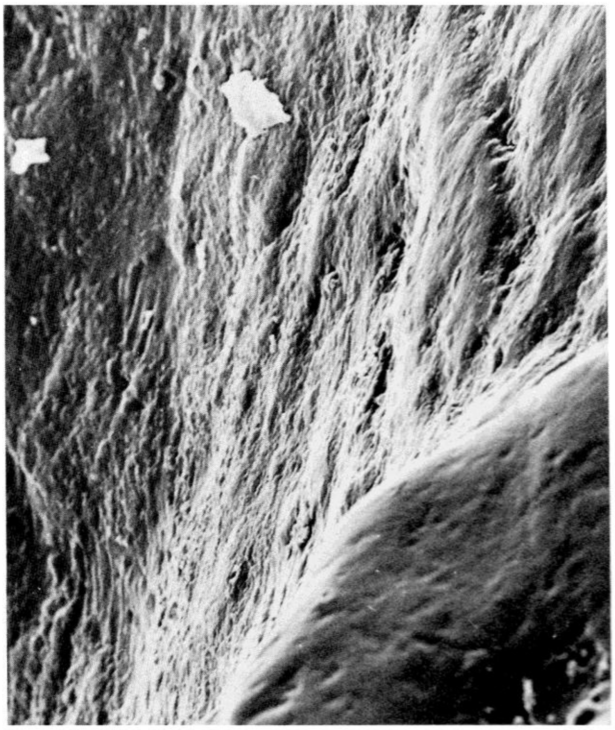

FIG. 9. *Detail of figure 8 (× 60).*

that under the scanning microscope is observed to be highly polished in the center, with no striations on the dentine (fig. 9). This polished appearance, associated with abrasion by the opal-phytolith-rich vegetable materials that are a major cause of tooth wear in grazers (Walker, Hoeck, and Perez 1978, Puech 1980), is absent in the interproximal grooves of hominid teeth.

Our study suggests that the initial lesion (as seen in *Sinanthropus officinalis*) takes the form of fine parallel scratches on the interproximal surface, the characteristic groove developing with root exposure in connection with the retraction of the gingiva. The size of the interdental space opened up must be influenced by the size of the toothpick used to remove the impacted food. Toothpick grooves will be characterized, then, by their occurrence on interproximal surfaces below the contact area in association with parallel scratches of varying width.[1]

1. Translated by P. Leek and H. Tyrand.